

Claims

1. A multi valve two-stage pulse tube type GM refrigerator having a rotary valve that comprises one track for flow to the regenerator and two tracks for flow to the pulse tubes.
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2. The multi valve two-stage pulse tube type GM refrigerator of claim 1 where the valve has two high pressure ports to the pulse tubes located on a single track and two low pressure ports from the pulse tubes located on a separate single track and
10 where there are two cooling cycles per revolution of the rotary face valve.
3. The multi valve two-stage pulse tube type GM refrigerator of claim 1 further comprising two buffer volumes.
- 15 4. The multi valve two-stage pulse tube type GM refrigerator of claim 1 where there are two cooling cycles per revolution of the rotary valve.
5. A three-track rotary valve for use in multi-valve two-stage pulse tube refrigerator where the valve comprises one track for flow to the regenerator and two tracks for
20 flow to the pulse tubes.
6. The rotary valve of claim 5 where one track of the three tracks permits flow into the first and second pulse tubes, the second of the three tracks permits flow out of the first and second pulse tubes and the third track permits flow in and out of the
25 regenerator.
7. A valve in accordance with claim 5 in which the ports to the first pulse tube and the second pulse tube in the valve seat have one of the same opening phase angle relative to the regenerator and a different phase angle.

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8. A valve in accordance with claim 5 in which the ports to the first pulse tube and the second pulse tube in the valve seat have one of the same length of time being open and a different length of time.
- 5 9. A valve in accordance with claim 7 in which gas flows to the second pulse tube before it flows to the first pulse tube.
10. A valve in accordance with claim 7 in which gas flows from the second pulse tube before it flows from the first pulse tube.
- 10 11. A valve in accordance with claim 5 in which gas flows to the second pulse tube for a longer period of time than the first pulse tube.